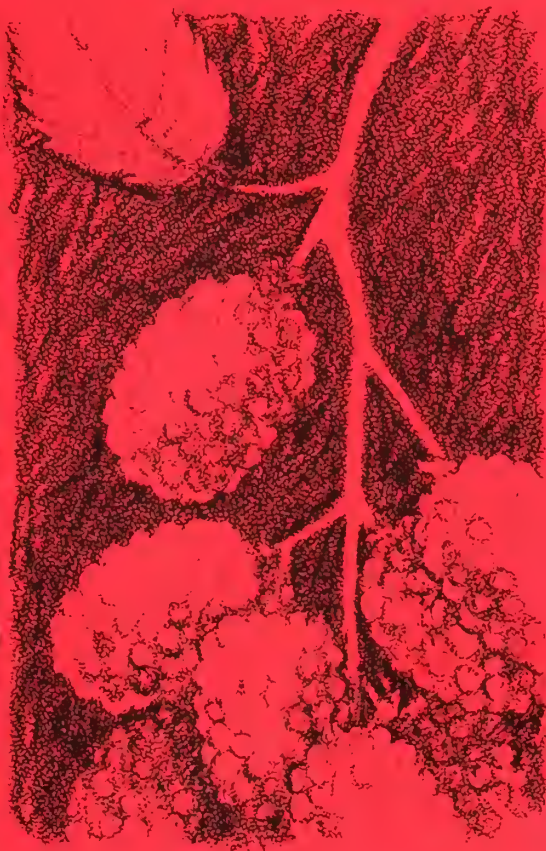


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GROWING ~~THE~~ ~~CIRCULAR~~ SMALL FRUITS IN THE HOME GARDEN



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GROWING SMALL FRUITS IN THE HOME GARDEN

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UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN · COLLEGE OF AGRICULTURE
COOPERATIVE EXTENSION SERVICE
CIRCULAR 935

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Urbana, Illinois

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Issued in furtherance of Cooperative Extension Work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. WILLIAM R. OSCHWALD, *Director*, Cooperative Extension Service, University of Illinois at Urbana-Champaign.

GROWING SMALL FRUITS IN THE HOME GARDEN offers many advantages to the family that is able to provide the space and care required. All of the major small fruits—strawberries, raspberries, blackberries, blueberries, currants, gooseberries, and grapes—may be successfully grown almost everywhere in Illinois. Small fruits (which are so called because the edible fruit is produced on a small perennial plant) may be grown when space is limited, and are popular even for small city lots. Space limitations can be overcome by fitting small fruit plants into the overall landscape in shrub borders, screen plantings, arbors, hedges, or perennial gardens.

A well-planned garden will supply fresh fruit from early spring to the first killing frost in the fall. The fruits produced in the garden will be appreciated for their pleasing taste and for their dietary value as sources of vitamins, minerals, and acids. Fruit of the best varieties harvested at peak quality from a home garden cannot be matched in the market, and surplus production can be canned, frozen, or preserved for use during the rest of the year.

Aside from the benefits of superior quality, cultivating small fruits at home can provide much pleasure and satisfaction. Careful selection of early and late varieties of different kinds of small fruits will supply fresh fruit over the longest possible season. Success, of course, depends upon careful attention to cultural details. This circular describes cultural techniques and varieties for reliable production in Illinois home gardens.

Size of Planting. The number of plants that the home gardener can grow is determined by the space available and the needs of the family. Home fruit plantings should be limited in size, especially if the primary objective is to supply fresh fruit for home use. Large plantings may be justified for local sales or for a 4-H project. Don't plant more than you can care for properly. Neglected plants will produce low yields and will harbor many destructive insects and diseases.

Plant spacings, approximate yields, and a suggested number of plants for a family of five are given in the table on page 5. The yields shown are dependent upon good care and management. The size and layout of the garden may vary according to the selection of fruits desired and the space and location available. When arranging small fruits in the garden, place the taller-growing fruits, such as trellised grapes, north of low-growing fruits, such as strawberries, to prevent shading.

Location. It is desirable to locate the small fruit garden near the house. If large trees are nearby, locate the garden to the south of them if possible. There is an advantage in planting adjacent to the vegetable garden for convenience of doing cultural chores. But sometimes the most convenient location does not have the most desirable exposure, soil, or water drainage.

The site should have reasonably fertile soil and be well drained. Avoid areas that collect water after a rain. A moderately elevated or sloping site which provides air drainage will reduce losses from late spring frosts. Exposure to full sunlight is preferred, although most small fruits will grow in locations shaded during a part of the day. Black raspberries and gooseberries can stand more shade than others. Where practical, take advantage of natural windbreaks such as buildings and hedgerows to protect the planting from severe winter winds which usually prevail from the northwest in Illinois.

Strawberries or brambles should not be grown for three years following tomatoes, potatoes, peppers, eggplant, melons, okra, peas, beets, or roses. Certain soil-borne wilt diseases are common to these crops, and severe losses can result if they are not rotated with nonsusceptible crops.

Preparing the Soil. Most small fruit plants occupy the same location for several years. Therefore, it is desirable to build up the soil fertility of the proposed location. Planning one or two years ahead can also help to reduce weed problems.

All small fruit plants benefit from the addition of organic matter to the soil. If well-rotted manure is available, apply 4 bushels (or 100 pounds) per 100 square feet (1,000 to 1,500 pounds per 1,000 square feet) in the summer or fall before planting. Add 25 pounds of 20-percent superphosphate for each 1,000 pounds of manure. Thoroughly work the manure into the soil. Compost, decomposed leaves, or lawn clippings may also be used. In September, sow a cover crop, such as rye, at 3 pounds of seed per 1,000 square feet. Turn under in early spring to improve the soil.

Weeds can be reduced by planting small fruits where row crops have been cultivated for one or two years (with the exception of certain crops, see above). The cultivation and hoeing destroy many weeds and help provide good soil conditions by thoroughly mixing organic matter in the soil.

If sod must be turned under, it should be done in the fall to allow decomposition to begin. Better yet, sod should be turned under and the ground cultivated at least one year prior to planting. Treat the soil to control harmful insects (see pages 50 to 54).

SPACING, BEARING AGE, AND PRODUCTION OF SMALL FRUITS

Fruit ^a	Planting distance ^b		Interval from planting to fruiting	Life of plants	Height of mature plant	Estimated annual yield per plant ^c	Suggested no. of plants for family of 5
	Between rows	Between plants					
	<i>feet</i>	<i>feet</i>	<i>years</i>	<i>years</i>	<i>feet</i>		
Strawberries (matted row).....	4	2	1	3-4	1	1½-1 qt./ft. of row	50-100
Everbearing (hills)	1-1½	1-1½	½	2-3	1	½ quart	100
Currants.....	6-8	4	2	12-15	3-4	3-4 quarts	2-4
Gooseberries.....	6-8	4	2	12-15	3-4	5-10 quarts	2-4
Raspberries							
Red.....	8-10	3	1	8-10	4-5	1½ quarts	20-25
Everbearing red	8-10	3	½	8-10	4-5	1 quart—spring	15-20
Black	8-10	3	1	8-10	4-5	½ quart—fall	15-20
Purple	8-10	3	1	8-10	4-5	1 quart	20-25
Blackberries						1½ quarts	20-25
Erect.....	8-10	4-5	1	10-12	3-5	1 quart	15-20
Thornless, trailing	8-10	6-10	1	8-10	6-8	4-10 quarts	8-10
					(staked or trellised)		
Blueberries	8-10	6-8	2	20+	5-10	3-4 quarts	6-8
Grapes	8-10	8-10	3	20+	5-6	¼-½ bushel	5-10
					(trellised)		

^a Listed in approximate order of ripening from early spring to fall.^b Minimum suggested spacings. See discussion of plant spacings in text. When a tractor is available, space the rows to fit the equipment to be used in cultivation, mowing, and spraying.^c At full bearing age, with good care.

All of the small fruits, except blueberries, grow satisfactorily in a soil pH range of 5.5 to 7.5. Blueberries require a pH of 4.8 to 5.2 for best growth. The pH refers to the acidity or alkalinity of the soil—with 7.0 as neutral and 6.0 to 7.0 slightly acid. See your county extension adviser for instructions on testing your soil and interpreting the results.

Before planting, work the soil as thoroughly as if planting a vegetable garden. The soil should be well pulverized, mellow, and moist.

Planting Stock. Healthy, vigorous plants are essential to establish a successful small fruit planting. The disadvantages of poor planting stock can never be overcome. It is generally wiser and cheaper, in the long run, to buy the best plants available. Reputable nurseries supply disease-free and true-to-name plants. The state certificate of nursery inspection is an assurance of healthy plants. When available, the plants, and particularly strawberry plants, should be virus free. Such plants are definitely superior and are worth the small extra cost.

You can obtain catalogs from several nurseries. For a list of nurseries, see "Sources of Small Fruit Plants," FR-2-79, published by the Department of Horticulture (see listing on page 54). General nurseries offer most of the small fruits while others specialize in particular crops. Orders should be placed early to obtain desired varieties. December or January is not too early to order plants for the following spring. The delivery date and method of shipment should be specified when placing the order.

One-year-old plants of medium to large size are generally best. The added cost for older or extra large plants is usually not justified, the exception being blueberry plants, which should be two years old.

Choosing Varieties. Varieties for home small-fruit plantings should be selected for high quality—either for eating fresh, preserving, or both. Many varieties of high-quality small fruits are not suited to commercial production, so the only source of these quality fruits may be your own garden. Resistance to diseases and winter hardiness should be considered. Careful selection of early and late maturing varieties will provide a harvest of fresh fruit during a longer period. The use of several varieties also helps to insure a successful planting as one variety may perform highly satisfactorily in one location but not in another. The varieties suggested in this circular are generally adapted to Illinois conditions; special notation is made where a particular variety is best for a given region. In addition to the varieties suggested, gardeners should compare one or two new varieties.

Care of Plants on Arrival. Most plants are dug by nurseries in



Heeling-in strawberry plants. Plants may be heeled-in after arrival from the nursery. This will prevent them from drying out before they can be set in the garden. (Fig. 1)

late fall or early spring when they are dormant and then shipped from cold storage as orders are received. Such plants, when handled properly, are usually superior to freshly dug plants.

Open the packages and examine the plants as soon as they arrive. *Do not let the plants dry out.* If the plants are dry when they arrive, soak the roots in water for one or two hours and plant immediately if possible. If planting must be delayed more than one day, the plants may be placed in cold storage or the refrigerator (32° to 40° F.) or "heeled-in" (see Figs. 1 and 2).

For cold storage, moisten the roots if they are dry, but be careful not to over-wet the plants or they may mold and rot. Plants in plastic bags may be kept satisfactorily for a week in your home refrigerator. Do not allow plants to freeze.

To "heel-in" plants, select a location that is well drained, shaded, and protected from the wind. Dig a trench deep enough to permit covering the roots, and long enough to spread the plants side by side one layer deep. Firm soil over the roots. (Do not cover the crown of strawberry plants.) Water thoroughly and keep shaded until ready to plant. Do not leave plants heeled-in any longer than absolutely necessary.



Blackberry plants properly heeled-in.

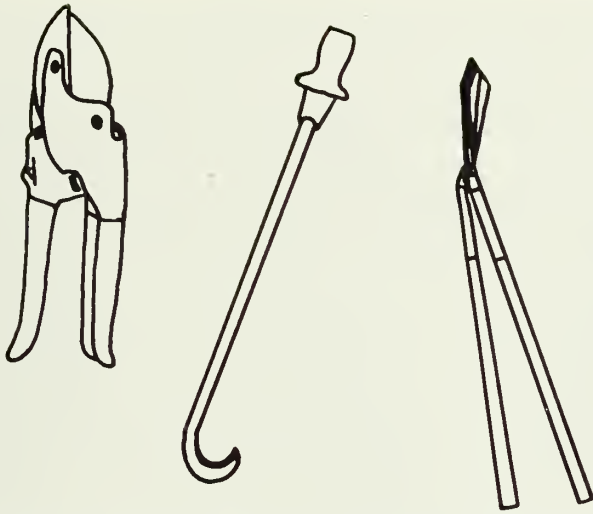
(Fig. 2)

Irrigation. Lack of rain while new plants are becoming established, during bloom and harvest, and during late summer and fall when fruit buds are forming can reduce the quantity and quality of fruit. Most small fruits require at least 1 inch of water per week during the growing season for optimum growth. Irrigation to supplement rainfall is especially important for soils that are subject to drouth, such as sandy soils, or soils with a shallow hardpan which restricts development of a deep root system.

If possible, locate the small fruit garden where adequate water is available for irrigation. Sprinklers, porous soaking hoses, and perforated hoses are suitable for applying water. Irrigate to thoroughly wet the soil that is occupied by the roots. Shallow watering is of little value and may be harmful.

Pruning Tools. Correct pruning and training are necessary for top production of the brambles, blueberries, currants, gooseberries, and grapes. The tools needed are neither expensive nor complex (see Fig. 3). The hand shears is useful for cutting back small branches and lateral shoots, and for summer topping. The lopping or long-handled shears is needed for larger branches and canes that cannot be cut with the hand shears. The bramble hook is a specialized tool for removing entire canes of the brambles. A pruning saw may be needed for grapes.

Pruning tools in good cutting condition are necessary for good pruning. Tools should be cleaned after use and their cutting surfaces wiped with an oily cloth to retard rust. The cutting edges must be kept sharp so as to make smooth, rapid-healing cuts.



Pruning tools include hand shears (left), bramble hook (center), and long-handled or lopping shears (right). (Fig. 3)

The Home Landscape. Individual or groups of small fruit plants can be included in the landscape to provide fresh fruit when space is not available for a defined fruit garden. Strawberries, particularly ever-bearing varieties, can be useful for ground cover plantings. Grape arbors or hedge plantings of erect blackberries, raspberries, or blueberries can be used effectively to partially screen or separate parts of the lawn or garden. Blueberries, especially, have attractive foliage coloring in the fall and therefore are useful as ornamental plants. A little imagination and careful planning can result in an eye-pleasing, as well as an appetizing, planting.

Strawberries

Strawberries are the most popular of the small fruits. They are the first fruit to ripen in the spring and are highly nutritious. A single cup of fresh strawberries supplies more than the minimum daily requirement of Vitamin C. Satisfactory crops may usually be produced in the home garden with minimum spraying.

Soil. Strawberries will grow satisfactorily in most garden soils but they require a relatively high level of soil fertility for optimum production. The soil pH should be between 5.5 and 6.5. Barn manure, preferably well-rotted, may be applied the year before planting (page 4). If manure is not available, commercial fertilizer can be added when

preparing the soil. Apply 15 to 20 pounds of 10-20-20 fertilizer, or equivalent, per 1,000 square feet, and work into the top 6 inches of soil.

Planting and Spacing. Strawberries should be planted as soon as the ground can be prepared in the spring. Planting is best done in March or April in Illinois to allow the plants to become well established before hot summer weather. If possible, the plants should be set during cloudy weather or during the late afternoon or evening. Set the plants to the proper depth and apply 1 pint of water per plant (see Fig. 5).

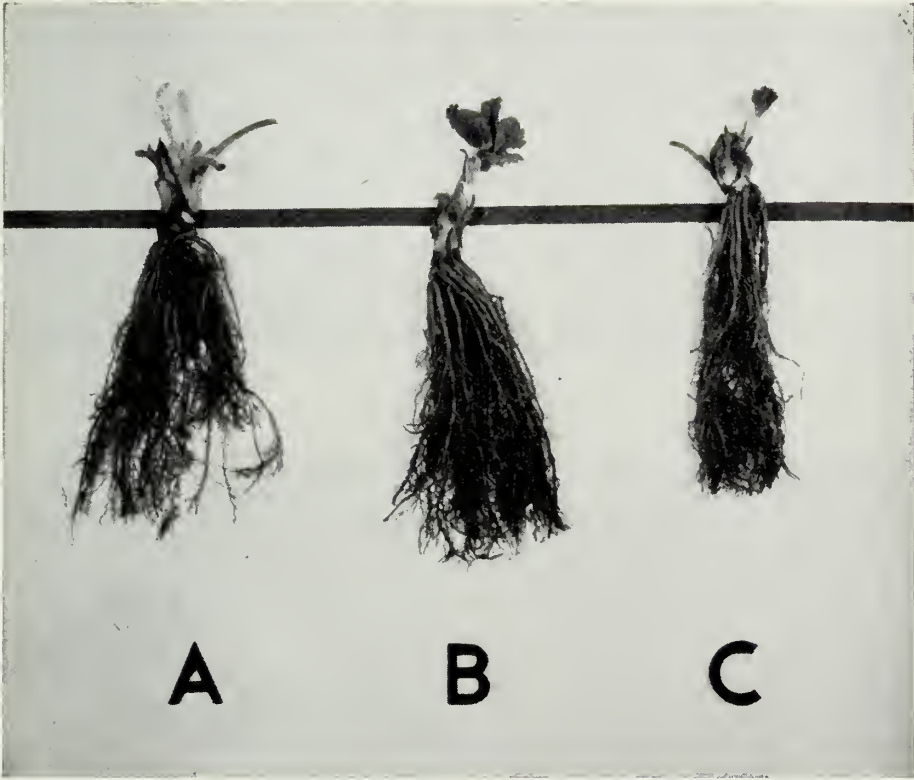
The matted-row system (see Fig. 6) is the most popular method for growing spring-bearing (standard) varieties in Illinois. The plants should be set 24 inches apart in rows $3\frac{1}{2}$ to 4 feet apart. The runner plants are allowed to root freely to form a matted row about 2 feet wide.

The spaced-row system (see Fig. 7) is a modification of the matted-row system. The original mother plants are set at the same spacings, but the runner plants are spaced to take root not closer than 4 inches apart. After a spaced row about 2 feet wide is obtained, all new runners are removed. This will give optimum growing conditions since strawberry rows can often be too dense for good production. Spaced-row culture requires more care than matted-row culture, but higher yields, larger berries, and fewer disease problems may justify the extra effort.

The hill system (see Fig. 8) is the best method to grow everbearing varieties. All runners are removed so that only the original plant is left to grow. This enables the original plant to develop numerous crowns



Strawberries are a popular small fruit and are easily grown throughout Illinois. (Fig. 4)



Set the plants at the correct depth. Plant A is set correctly. Plant B is too deep, and plant C too shallow. The soil should just cover the tops of the roots. (Fig. 5)

and flower stalks. The plants are set 1 foot apart in rows that are 1 foot apart. Usually rows are arranged in groups of 3 or 4, with a 2-foot walkway between each group of rows. The planting should be cultivated and hoed for the first 2 or 3 weeks, and then the entire bed may be mulched with sawdust, ground corncobs, or straw.

Remove Blossoms. Remove flower stems from newly-set plants during the first summer as soon as they appear. Allowing the fruit to develop during the first season will retard runner development and reduce the crop the next year. Flowers that develop after July 1 on ever-bearing varieties should be left for a late summer or fall crop.

Weeds. Cultivation and hand hoeing should begin soon after the plants are set. This will control weeds and help runners take root. Repeated cultivation every 10 to 14 days is most effective since weeds are easiest to kill when they are small. Cultivation should be shallow around the plants to prevent injury to the roots.



In the matted-row system, plants are allowed to root freely. Two good matted rows are shown. (Fig. 6)



In the spaced-row system, runner plants are placed by hand to grow 4 or more inches apart. (Fig. 7)



Everbearing strawberries growing in the hill system. The planting shown is arranged in 4-row beds and is mulched with ground corn cobs. (Fig. 8)

Chemical herbicides can be used to help control weeds but they may be impractical for small gardens. See Circular 1144, "Controlling Weeds in Home Fruit Plantings" (listed on page 54).

Fertilizing. Strawberry plants should be fertilized in early August, with 4 to 6 pounds of 33-percent nitrogen fertilizer per 1,000 square feet. This amount of nitrogen (1 tablespoon spread in a narrow band about 3 inches from each plant) may also be applied about a month after planting if the plants are not vigorous. The August application may be broadcast over the rows but it should be applied when the foliage is dry. Brush the leaves with a broom or rake to remove fertilizer particles, for if allowed to remain they may cause burning.

Be careful when applying fertilizer. Too much will cause excessive vegetative growth, reduce yields, increase losses from fruit and foliar diseases, and result in winter injury. Application of fertilizer during the spring of the fruiting year is not recommended.

Mulching. Strawberries should be mulched to protect the plants during extreme cold winter weather and against damage from heaving during alternate freezing and thawing weather. Mulching also conserves soil moisture, keeps the berries clean, and provides better picking conditions. Use a loose organic material such as clean, seed-free wheat straw. Straw can also be used to cover the plants temporarily during cold nights to protect the flowers from frost injury.

Apply straw mulch after several frosts in the fall, but before the temperature drops below 20° F. This generally occurs between mid-November and mid-December in Illinois. Apply 100 to 150 pounds of straw per 1,000 square feet (2 to 4 bales) 3 to 4 inches deep over the rows.

Remove part of the straw from the plants in the spring when new growth starts. Put the excess straw between the rows. In the hill system, ground corncobs or sawdust may be used as a soil mulch during the growing season. Apply sawdust or corncobs in a layer 1 to 2 inches deep. About 4 cubic yards are needed to cover 1,000 square feet. Straw mulch for winter protection should be used over the plants when these materials are used as a soil mulch.

Frost Control. Strawberry buds, blooms, and immature fruits are very susceptible to frost and freezing damage in early spring (see Fig. 9). These losses can be prevented by covering the plants with straw or by careful and timely application of irrigation water. Irrigation water should be applied when the temperature at plant level reaches 33° F. Mist-type sprinklers that put out a minimum quantity of water should be used to prevent unnecessary flooding. A finely perforated plastic hose may also be used. Continue to irrigate until temperatures are above

freezing in the morning. Water will freeze on the plants but will not injure the blooms as long as water is being applied during the entire freezing period.

Straw may also be raked over the rows for protection. If this is done, remove the straw during the day, and only cover the plants on nights when there is danger of frost.

Renewing the Patch. Properly managed strawberries will bear fruit more than one year. Usually a patch may be picked 2 to 4 years, but only good plantings should be maintained. Weedy or diseased plantings are best destroyed and replaced.

Immediately after the harvest is completed, the strawberry planting should be renovated to achieve good production the next year. First, mow the old foliage with a sickle, scythe, or power mower, cutting off



The blossoms with black centers at lower left were killed by frost. This injury could have been prevented by sprinkler irrigation or by covering with mulch. (Fig. 9)

the leaves about 1 inch above the crowns. Rake the leaves and other debris from the patch, and compost or burn them. Do not mow the leaves if renovation cannot be done within a week after harvest is finished. Broadcast 10 to 15 pounds of 10-10-10 or 12-12-12 fertilizer per 1,000 square feet over the planting. Apply herbicides carefully and as recommended. Narrow the rows to 10 to 12 inches by hoeing or rototilling and hoe out all weeds. If the plants in the narrowed rows are crowded, it may be advisable to remove some of them. Irrigate thoroughly to encourage the plants to recover and make new runners for the next crop.

Everbearing Strawberries. Everbearing strawberries differ from the standard or spring-bearing varieties in that they bear fruit during the spring and then bear more or less continually throughout the summer and fall until frost. Although they are popular with some home gardeners, everbearers do not produce as good a fruit as the better standard varieties. They require more attention than standard varieties, and the berries are likely to be soft and lack flavor during hot weather. Irrigation is usually necessary to produce summer and fall crops.

Everbearing strawberries are usually grown in the hill system (see pages 10 to 11). Home gardeners who have limited space available may grow them in terraced beds, pyramids, and barrels. These strawberries may also be used as edging plants or as ground covers in the landscape plan. Sometimes they are grown as potted house plants or trained on "totem poles." (If grown indoors, the plants must have good light and the blossoms must be pollinated by hand to develop well-formed berries.) Although these methods are not as productive as the conventional systems, they do have ornamental value.

Terraced beds may be constructed in various shapes to fit a given area by using retaining walls of wood, concrete, metal, asbestos siding, or almost any material that is rigid enough to serve the purpose. The individual beds should be 8 to 12 inches wide and 6 to 8 inches deep. One row of plants spaced 12 inches apart may be set in each bed. A popular terraced bed is the pyramid which may be purchased as a unit with retaining walls, plastic cover, net for bird protection, and sprinkling device (see Fig. 10). A pyramid of 50 plants should produce about 35 quarts of berries during the first growing season.

Strawberry barrels (Fig. 11) require less space than terraced beds, but they are less productive and more difficult to manage. Almost any type of barrel may be used for this purpose. With a 2-inch auger, bore 3 or 4 holes in the bottom of the barrel and a series of holes in the sides starting 6 inches from the bottom. Space the holes 10 to 12 inches apart completely around the barrel and 6 to 8 inches apart vertically. Stagger



Strawberries may be grown successfully in pyramids when space is limited. Each plant may be expected to produce from 1 pint to 1 quart of berries in a growing season. (Fig. 10)

each series so that every hole will be centered between the two holes just below. Sunlight is important for successful growth, and the barrel must be given a half-turn at least twice a week. If it is too large to turn easily, mount the barrel on castors, an old wagon wheel, or a clothes-line turntable. Otherwise, set the plants only on the east, south, and west sides of the barrel.

Place 2 inches of gravel or broken crockery in the bottom to provide drainage for excess water. A sand core is important to permit water to move to the lower rows of plants. This core may be constructed by using a 5-inch diameter tin can with both ends removed. The can is placed in the bottom of the barrel, filled with coarse sand, and gradually moved up and refilled with sand as soil is packed firmly around it.

The plants are set through the holes as the barrel is filled. Spread the roots inside the barrel so that the roots are angled slightly upward to allow for settling of the soil. Set a few plants in the top, but leave the center (sand core) open for watering. Water thoroughly when planting is completed and often enough thereafter to keep the soil fairly moist.

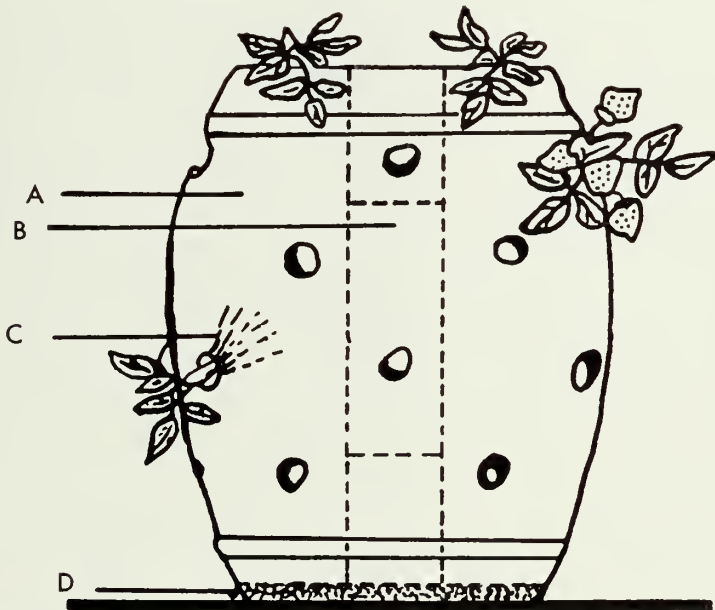
Small amounts of well-rotted manure or a handful of a complete fertilizer may be added every 2 or 3 weeks if the plants appear to lack

vigor. The barrel should be protected during the winter by bringing it into a building or wrapping it with 6 inches of straw or other mulching material to prevent excessive drying and freezing injury.

Several varieties of so-called "climbing strawberries" are available to home gardeners for training on fences or trellises. They are expensive and offer no value over standard varieties, which also can be trained on trellises.

Spring-bearing (June-bearing) Varieties. There are many varieties of strawberries, and most of them appear highly recommended in nursery catalogs. However, the home gardener should select varieties on the basis of dessert quality, preserving quality, season of maturation, and disease resistance. The spring-bearing varieties listed in the table on page 18 have proved their adaptability to Illinois. New varieties are continually being introduced so that the list is subject to change.

Although there is no sharp line of demarcation between northern and southern Illinois for strawberries, some varieties definitely perform better in a given latitude. Thus, for the purposes of this circular, northern and southern Illinois are separated by a line approximately from Quincy in Adams County to Danville in Vermilion County.



Construction of a strawberry barrel. A. Fertile garden soil. B. A core of sand for even watering, made by using a can as a form. C. Plants set with roots spread out and at a slight upward angle to allow for settling of the soil. D. Layer of gravel or broken crockery for drainage. (Fig. 11)

SPRING-BEARING STRAWBERRY VARIETIES FOR HOME GARDENS IN ILLINOIS^a

Season	Variety	Best adapted to northern (N) or southern (S) Illinois
Early	Earliglow	N, S
Early	Midland	N
Midseason	Catskill	N
Midseason	Guardian	N, S
Midseason	Midway	N, S
Midseason	Raritan	N
Midseason	Redchief	N, S
Midseason	Surecrop	N, S
Late	Sparkle	N
Late	Tennessee Beauty	S

^a These are general-purpose varieties rated "good" or better for yield and dessert quality. See characteristics 2 and 3 below for freezing and processing, and characteristics 7, 8, and 9 for resistance to troublesome diseases.

The varieties below are grouped according to special characteristics that home gardeners may wish to consider—good yield, for example, may be sacrificed in favor of superior quality.

1. *Superior flavor for fresh use:* Armore, S; Earliglow, N, S; Fairfax, N, S; Fletcher, N; Midland, N; Redchief, N, S; Redglow, N, S; Sparkle, N.

2. *Excellent for freezing:* Earlidawn, N, S; Earliglow, N, S; Fletcher, N; Midland, N; Pocahontas, N, S; Redchief, N, S; Redglow, N, S; Sparkle, N; Tennessee Beauty, S.

3. *Excellent for preserves and jams:* Blakemore, S; Pocahontas, N, S; Redchief, N, S; Surecrop, N, S; Tennessee Beauty, S.

4. *Earliest:* Blakemore, S; Cardinal, S; Earlidawn, N, S; Earliglow, N, S; Midland, N; Premier, N; Redglow, N, S; Sunrise, N, S.

5. *Latest:* Jerseybelle, N, S; Redstar, N; Vesper, N, S.

6. *Bearing very large fruit:* Apollo, S; Catskill, N; Jerseybelle, N, S; Raritan, N; Robinson, N; Vesper, N, S.

7. *Resistant to red stele disease:* Darrow, N, S; Delite, N, S; Earliglow, N, S; Guardian, N, S; Midway, N, S; Redchief, N, S; Redglow, N, S; Scott, N, S; Sparkle, N; Sunrise, N, S; Surecrop, N, S. Select only from these varieties when the garden area is known to be infected with red stele disease.

8. *Resistant to Verticillium wilt disease:* Blakemore, S; Catskill, N; Earliglow, N, S; Guardian, N, S; Robinson, N; Surecrop, N, S. Allow at least three years between all other varieties listed and Verticillium-wilt-susceptible crops (see page 4).

9. *Resistant to foliar diseases:* Fairfax, N, S; Fletcher, N; Guardian, N, S; Midland, N; Premier, N; Redchief, N, S; Surecrop, N, S; Tennessee Beauty, S. All other varieties listed will require control measures during most seasons to avoid damage from foliar diseases.

Everbearing Varieties. There are no red-stele-resistant everbearing strawberry varieties, and no everbearing varieties currently available are comparable to the better spring-bearing ones. Gem, Geneva, Ogallala, Ozark Beauty, Quinault, and Streamliner produce satisfactorily with good care. See page 15.

Brambles

Raspberries

Raspberries ripen shortly after strawberries and are popular in all parts of Illinois. Plantings that are well cared for may produce good crops for 10 years or more. Red, black, purple, and yellow fruit types are available. The everbearing varieties bear one crop in the early summer and another crop in the fall. Black varieties are seriously damaged by viruses transmitted from tolerant red varieties. Thus, black and purple raspberries should be planted about 500 feet from red varieties.



Fruiting cluster of red raspberry. (Fig. 12)

RASPBERRY VARIETIES FOR HOME GARDENS IN ILLINOIS

Season	Variety	Best adapted to northern (N) or southern (S) Illinois	Notes
Red Raspberries			
Early	Sunrise	S	Medium size berries, two weeks earlier than Latham.
Midseason	Newburgh	N, S	Large berries, slightly earlier than Latham.
Late	Citadel	N, S (trial)	Vigorous, large, firm, dark red fruit.
Late	Latham	N, S	Very hardy, nearly thornless. Fruit often crumbly, quality not high.
Everbearer	Fallred	N	Late summer crop, early fall crop.
Everbearer	Heritage	N, S	Promising new variety.
Everbearer	September	N, S	Reliable everbearing variety.
Everbearer	Southland	S	Best adapted to southern Illinois with good crops as far north as Urbana.
Black Raspberries			
Early	Allen	N, S	Very productive. Many berries ripe at one time.
Early	New Logan	N, S	Originated in Illinois, liked for its earliness.
Midseason	Bristol	N, S	Must control anthracnose.
Midseason	Cumberland	N, S	Must control anthracnose.
Midseason	Dundee	N, S	One of best quality black raspberries. Susceptible to mildew.
Midseason	Jewel	N, S	Productive; large fruit.
Late	Morrison	N, S	Largest berries of black varieties.
Purple Raspberries			
Midseason	Amethyst	N, S	Very productive new variety.
Midseason	Brandywine	N, S (trial)	Promising new variety. Vigorous plants, large, reddish-purple fruit.
Late	Clyde	N, S	Most vigorous and productive purple variety. Tolerant of anthracnose.
Everbearer	Purple Autumn	N, S	Originated in Illinois, only currently available everbearing purple. Very susceptible to anthracnose.
Yellow Raspberries			
Very late	Amber	N, S	Best flavored, sweetest raspberry for home use.
Everbearer	Fallgold	N	Only currently available yellow everbearing variety.

or else virus-free plants should be purchased and a careful pest control program followed.

Plants and Planting. One-year-old, No. 1 grade plants are best for establishing new plantings. Virus-free plants should be obtained when available. Wild brambles growing around or near the new planting should be destroyed since they harbor destructive insects and diseases.

Raspberries are best planted in early spring (late March or early April). Prevent the plants from drying out while lying in the field by placing them in a bucket of water or dipping the roots in a thin clay mud. Carefully spread the roots in the planting hole and firm soil over them. Set red raspberries 2 to 3 inches deeper than they were in the nursery and set black and purple raspberries about 1 inch deeper. Apply 1 or 2 quarts of water around each plant.

Cut red raspberry plants back to 8 to 12 inches after planting. The canes or "handles" of black and purple raspberries should be cut off at ground level, removed, and burned to prevent disease infestation.

Plant Spacing and Support. Raspberries may be grown in hills or in hedgerows, and the plant spacing depends on the system of training to be used. (See the table on page 5 and the discussion of training systems on pages 24 to 28.) Red raspberries spread by root suckers and naturally form a hedgerow. Black and purple raspberries do not spread by root suckers and will remain as individual plants.

Fertilizers. For maximum production, fertilizer should be applied prior to planting (see page 4). If manure is not available, apply 2 ounces of 5-10-5 fertilizer around each plant 10 to 14 days after planting. In the second and subsequent years the plants should be fertilized with 10-10-10 or 12-12-12 fertilizer at a rate of 15 to 20 pounds per 1,000 square feet broadcast along the hedgerow, or about $\frac{1}{2}$ cupful around each plant in the hill system. Apply in early spring before new growth begins.

Animal manures may also be used to fertilize established raspberry plants. In the spring before new growth begins, apply 300 to 400 pounds of cow manure per 1,000 square feet, or 100 to 200 pounds of poultry manure per 1,000 square feet.

Do not apply fertilizer during the summer or early fall. Such applications may injure the plants or may force soft succulent growth which is very susceptible to winter injury.

Mulching. Generally, raspberries should be cultivated during the early part of the first summer. In late summer, after the plants are

established, they may be mulched. Mulched raspberries grow better, produce more, and have larger berries. Straw, crushed corncobs, leaves, and sawdust are common mulching materials. Sufficient mulch, 4 to 8 inches deep, is needed to suppress growth of weeds. Mulch material should be added each year as needed. If turf is used between the rows it is best kept closely mowed.

Plantings that are mulched with corncobs or sawdust will require extra nitrogen fertilizer during the first two years. Apply double the amounts of fertilizer recommended above. After two years, the amount of fertilizer applied may be reduced to half because the mulch will release fertilizer nutrients to the plants as it decomposes.

Blackberries

Blackberries are well suited to the home fruit garden in the southern half of Illinois. They are too susceptible to winter damage for dependable production in northern Illinois. Erect and trailing plant types are available, and each requires different culture. The trailing varieties require support and are not very winter-hardy. Presently available trailing varieties require special care if they are to be grown in Illinois. Plant breeders are developing hardy thornless blackberry varieties that will increase the interest in this luscious fruit.



Fruiting cluster of blackberry. (Fig. 13)

BLACKBERRY VARIETIES FOR HOME GARDENS IN ILLINOIS

Season	Variety	Best adapted to northern (N) or southern (S) Illinois	Dessert quality	Notes
Erect Blackberries				
Early	Cherokee	S	Good	Promising new thorny blackberry developed in Arkansas.
Early	Cheyenne	S	Good	Promising new thorny blackberry developed in Arkansas.
Early	Darrow	N, S	High	Long fruiting season, very productive. May produce some fruit in fall.
Early	Ranger	S (trial)	Good	Promising winter-hardy variety.
Early	Raven	S (trial)	Good	Promising winter-hardy variety.
Thornless Trailing Blackberries				
Early	Black Satin	S	Fair	Three weeks before Thornfree. Good quality for pies and tarts.
Midseason	Dirksen Thornless	S	Fair	Two weeks before Thornfree. Good quality for pies and tarts.
Late	Thornfree	S	Fair	Hardy to about -5° F. Large, tart berries.
Late	Thornless Boysenberry	S	Good	Very large berries. Do not propagate from root cuttings. Provide winter protection.

Planting and Spacing. Blackberries are best planted in early spring, using the same care as for planting raspberries.

Spacing will depend on the trellis and training system to be used (see pages 24 to 28). Most erect blackberry varieties can be grown without supports and spaced 4 to 5 feet apart in rows 8 to 10 feet apart.

Set the plants at the same depth as they were planted in the nursery. Cut the tops back to 6 inches. Cultivation, mulching, and fertilizers are the same as for raspberries (see pages 21 to 22).

Winter Protection. Most trailing thornless blackberry varieties are not very hardy and are suggested only for southern Illinois. With special protection they might be grown in northern areas, but even then winter injury may occur. The canes can be protected by covering lightly with soil or preferably with straw after they become dormant in the fall (about mid-December). When danger of severe cold weather is past

in the spring, uncover the canes, do the dormant pruning, and tie the canes to a support.

Sterility Problems. Sterility in some blackberry varieties has been a problem in recent years. Affected plants generally make good growth and bloom profusely but produce only a few malformed berries. If such plants occur in your garden, they are best destroyed. The varieties listed in the table on page 23 have been observed to bear rather consistently in several locations in Illinois.

Training and Pruning Brambles

Growth and Fruiting Habits. In order to prune the brambles intelligently, it is essential to understand their growth and fruiting habits. Brambles bear fruit on biennial canes. The roots and crowns are perennial. All brambles send up new shoots during each growing season from the crown. Erect blackberries and red or yellow raspberries develop new shoots from both the crown and roots. These shoots, regardless of origin, grow vigorously during the summer, initiate flower buds in the fall, overwinter, and bear fruit the following season. The fruit is borne on leafy shoots arising from lateral buds on one-year-old canes. The canes then gradually dry up, dying shortly after harvest. Meanwhile, new shoots are developing to repeat the cycle, thus providing fruiting canes each year.

The everbearing types bear fruit twice on the same cane. The new shoots bear a crop at the tips in the fall and again the next season further down on the canes, after which they die. The fruit canes of such types *should not be pruned after the fall crop* since this would remove the fruiting wood for the spring crop. However, since the everbearing varieties produce fruit abundantly on primocanes (canes of the current season's growth), it is possible to grow them *solely for the fall crop* by mowing all of the canes as close to the ground as possible in the spring before growth begins. Then only the abundant crop on the primocanes is harvested in the fall. This practice eliminates all labor of hand pruning and the problems associated with winter injury to the overwintered canes. Common fungus diseases are also held to a minimum. The Heritage variety is well suited to growing in this manner.

Variation in the development of lateral branches must be considered in order to properly prune brambles. Black raspberries, purple raspberries, and erect blackberries develop strong lateral branches when the new shoots are cut back early in the growing season. This characteristic is responsible for the practice of pinching or summer topping which consists of snapping off or cutting with shears the top 3 or 4 inches

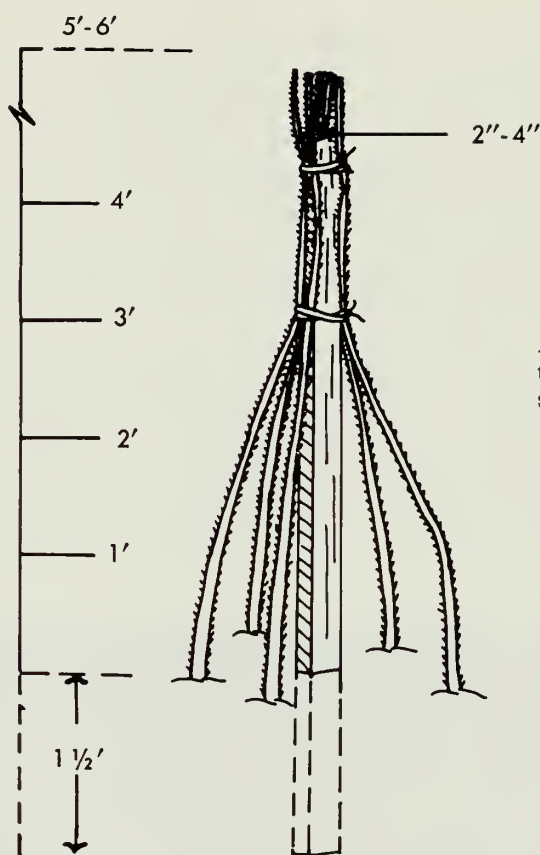
of the new shoots (Fig. 14). But this practice has no advantages and may be detrimental when used on red and yellow raspberries, semi-erect blackberries, and trailing blackberries. With red and yellow raspberries the resulting new laterals are generally weak, often break away from the cane when fruiting the following year, and are easily winterkilled. Topping also tends to induce more sucker plants than desired.

Supports. Some type of support or trellis is desirable, although all brambles, except possibly the trailing blackberries, may be grown without support. Fruit on supported canes is clean and a minimum of the crop is lost due to breakage of the canes by wind, cultivation, and picking. Supports also facilitate harvesting and other cultural practices, and in the long run will pay for themselves. Trellised plantings can usually be kept more attractive in the home landscape.

Many types of trellises and methods of training are in use by bramble growers. The following are some of the simplest methods of satisfactory trellis construction.



Black and purple raspberries and erect blackberries are pinched back 3 to 4 inches after the primocane has reached the desired height in the summer. This results in the development of lateral shoots. (Fig. 14)

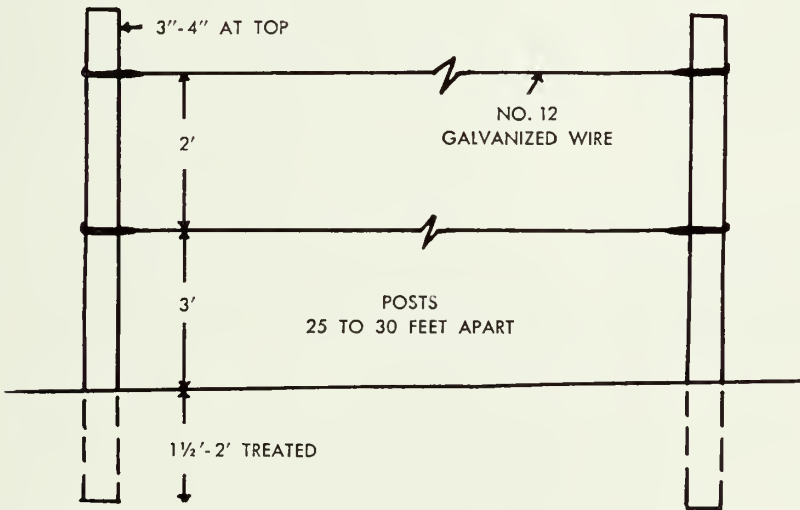
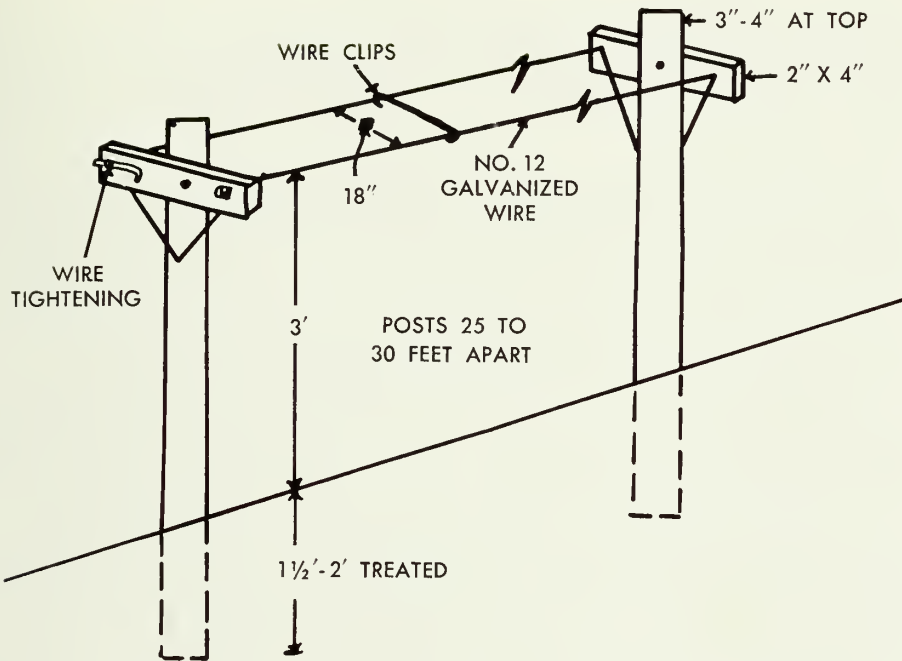


A red raspberry plant trained and pruned to the staked-hill system.

(Fig. 15)

The hill system of culture (see Fig. 15) may be used for any of the bramble fruits. A single stake, 2 to 4 inches in diameter, driven into the ground, supports the plant. Five to eight canes are tied in one or two places to the stake in the spring following dormant pruning. This system is most useful in home garden plots where a small power cultivator can be used. The plants are usually set 4 to 6 feet apart each way and restricted to a clump. Very little hand hoeing is needed and the fruit is easy to pick.

Wire trellising systems (Fig. 16) are more practical for large plantings. Posts for building a trellis may be either metal or wood. If wood posts are used, the underground parts should be treated with a wood preservative to extend their life. Pentachlorophenol, 1 gallon (50 per cent) in 10 gallons of kerosene, stove oil, diesel oil (#400), or other light oil is a satisfactory preservative. The posts should be soaked for 7



Trellises. Horizontal trellis suitable for red raspberries and requiring minimum tying of canes (top). Two-wire vertical trellis to which canes are tied (bottom). (Fig. 16)

days in a 50-gallon drum containing enough of this solution to cover the post 3 to 4 inches above ground level. Posts should be spaced 25 to 30 feet apart in the row with the end posts braced or anchored. Do not plant against freshly treated posts. A 12-gauge galvanized wire is adequate for the trellis.

The horizontal trellis is used with the hedgerow system, the most common system of training. The plants form a solid row that is kept about 18 inches wide. Each spring the canes within the row are thinned so that they are about 4 to 8 inches apart. The canes are supported between the trellis wires and do not have to be tied with this system. Wire clips are used to keep the wires from spreading between the posts.

The vertical trellis is used with the linear system, a modification of the hedgerow system that allows better control of weeds, diseases, and insects. Plants are maintained in a narrow row and are tied to the trellis wires. This system is most useful with trailing blackberries.

Pruning Red and Yellow Raspberries. Regardless of the training system being used, these types should be pruned twice each year, once in early spring and again as soon as possible after fruiting. New shoots of red and yellow raspberries *should not be summer topped*.

Spring pruning should be done early before the buds begin to swell but after danger of severe cold is past. All short and weak canes should be removed, and the remaining vigorous canes should be thinned to 5 to 8 canes per stake in the hill system (see Fig. 15), or spaced 4 to 8 inches apart in other systems. Only the largest canes should be saved, as these are the most fruitful. Cut the remaining canes back moderately



Red raspberry plant before (left) and after (right) dormant pruning.

(Fig. 17)

to 5 to 6 feet from the ground level. Canes shorter than 5 to 6 feet do not need to be cut back unless winter injury extends below this height. Where no support is provided, cut the canes back to about 3 or 4 feet, regardless of original height (see Fig. 17).

Fruited canes may be removed any time after harvest since they die soon after fruiting. Although this pruning may be delayed until the following spring, cutting these canes off at the ground level as soon as possible after harvest is preferred since their removal at this time encourages growth of the new shoots and reduces disease and insect problems. Remove the prunings from the planting and burn them.

The canes of the everbearing varieties are pruned the same way as ordinary varieties in the spring and following the summer harvest. The shoots that fruit in the fall at the tip bear fruit again the next spring farther down, *so do not remove these canes* after the fall harvest.

Pruning Black Raspberries, Purple Raspberries, and Erect Blackberries. These brambles should be pruned three times each year, during the summer, early spring, and after harvest.

Summer pruning is an essential step in the production of these brambles. All new shoots should be pinched back 3 to 4 inches when they develop to the desired height (see Fig. 14). If grown without supports, black raspberries are pinched when the new shoots are about 24 inches high; purple raspberries and erect blackberries are pinched when they reach 30 to 36 inches. If grown with supports, the shoots can grow 6 to 8 inches more before pinching. This operation usually coincides with harvest and the plantings should be examined several times as the new canes develop over a period of several weeks.

Dormant pruning (Fig. 18) is best done in early spring before the buds begin to swell. All weak canes should be cut out at the ground level, leaving 4 or 5 of the most vigorous canes (at least $\frac{1}{2}$ inch in diameter) per plant. The lateral branches on the remaining canes are thinned out and shortened. Remove all weak or dead laterals (usually $\frac{1}{4}$ -inch diameter or less), and shorten the laterals of black raspberries to 8 to 10 inches of growth or 8 to 12 buds per lateral. Purple raspberries and erect blackberries are more vigorous; thus the laterals may be left 12 to 18 inches long or about 15 buds per lateral.

Erect blackberries send up root suckers in addition to the new canes that grow from the crown. If these have all been allowed to grow during the previous season, they should be thinned out during the dormant pruning so that there are about 3 or 4 canes per lineal foot of row. A better practice is to remove the excess suckers during the summer between and in the rows, leaving only those desired for fruiting next sea-



Black raspberry plant before (left) and after (right) pruning. Purple raspberries and erect blackberries are pruned in a similar manner. (Fig. 18)

son. The suckers should be pulled out if possible since they do not regrow as quickly as those that are cut off at the ground level.

Fruited canes of black and purple raspberries and erect blackberries should be removed after harvest.

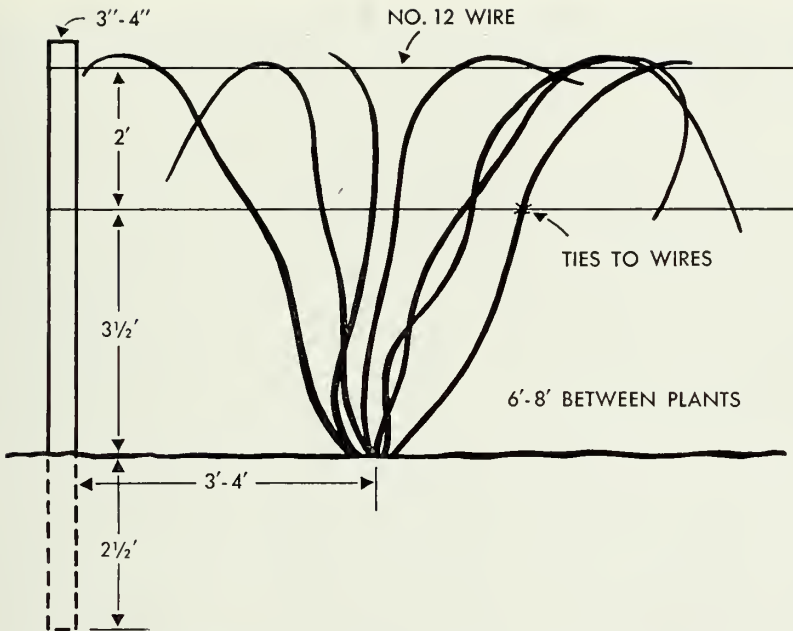
Pruning Trailing Blackberries. These brambles are pruned twice, once in early spring and again after harvest. Pinching the new shoots as they develop is not practical.

Spring pruning of these brambles consists simply in selecting the best canes for tying to a support and removing the others (Figs. 19 and 20). Select the best 8 to 16 canes of trailing varieties. If stakes are used for support, the canes are wrapped around the stake, tied at two or three places, and cut off to the height of the stakes. On a horizontal trellis, the canes are wound around the wires and tied at intervals. On a vertical trellis, the canes are tied to the wires without being wound.

Remove fruiting canes after harvest.

Blueberries

Blueberries are delicious when eaten fresh, are tasty in pies, and easily frozen. However, this fruit is not commonly grown in Illinois and is relatively unknown to many home gardeners. Blueberries have very exacting soil and cultural requirements, but if properly handled can be grown successfully. Soils and locations that naturally provide optimum growing conditions are very limited in Illinois, so careful attention must be given to cultural details.



Dormant pruning and training of trailing blackberries to a two-wire vertical trellis. (Fig. 19)



A trailing blackberry plant trained and pruned to the hill system. Note the new canes growing from the base of the plant. (Fig. 20)

BLUEBERRY VARIETIES FOR HOME GARDENS IN ILLINOIS

Season	Variety	Best adapted to northern (N) or southern (S) Illinois	Dessert quality	Notes
Early	Collins	S	Good	Attractive large berries.
Midseason	Berkeley	N, S	Fair	Large berries, productive.
Midseason	Bluecrop	N, S	Good	Large berries. Slightly earlier than Berkeley.
Midseason	Blueray	S	Good	Large berries.
Midseason	Jersey	N, S	Fair	Produces large crop. Growing well in several locations in Illinois.
Late	Coville	N, S	Good	Good variety to extend season. Berries tart until ripe.
Late	Herbert	N, S	Very good	Productive. Large fruit.
Very late	Lateblue	N, S	Good	Large, productive.



Blueberry fruit cluster.

(Fig. 21)



A vigorous 3-year-old blueberry bush heavily laden with fruit. (Fig. 22)

Soil. Blueberries require an acid soil relatively high in organic matter. A soil pH of 4.8 to 5.2 is best for optimum growth.¹ If your soil pH is between 5.2 and 6.2, make a mixture of half acid peat moss and half top soil. Use this soil-peat mixture in a 2-foot-diameter planting hole that has a depth of 12 inches.

If your soil pH is above 6.2, individual plants can be grown in tubs buried in the garden. Halves of 50-gallon drums, with drainage holes cut in the bottom, are suitable. First burn out any residues that might be injurious. Bury the drum in a sunny area and leave 1 to 2 inches of the rim above ground level. Fill the tub with an acid soil (pH 4.8 to 5.2) high in organic matter (make a mixture with acid peat moss if necessary). Set one blueberry plant in each tub.

Irrigation. Blueberries are shallow-rooted and grow best where the water table is 14 to 22 inches below the soil surface. Because of this water requirement, blueberry plants must be irrigated in most parts of Illinois. Don't attempt to grow blueberries unless you can supply needed water when the rainfall is not adequate. In addition, the soil must freely drain as blueberry plants cannot tolerate standing water.

Mulching. Because blueberries are very subject to drouth injury

¹ Your county extension adviser can test your soil for a small fee.

on most Illinois soils, mulching is recommended in addition to irrigation to help stabilize soil moisture. The mulch also helps to supply organic matter. A deep mulch of sawdust or crushed corncobs is best. Apply 4 to 6 inches of mulch soon after the plants are set. Maintain the mulch by adding 2 to 4 inches as needed. Rows can be mulched 3 or 4 feet wide with the area between kept in mowed turf. Otherwise, the entire planting may be mulched to completely control weeds. Leaf mold, pine needles, lawn clippings, straw, hay, or wood chips can also be used, but sawdust or crushed corncobs are preferred.

Planting and Spacing. Buy 2-year-old plants of medium to large size. Avoid using plants older than 3 years if possible, as the extra cost is not justified, and they may be cull plants that were too weak to sell at a younger age.

For each plant remove one bushel of soil and mix it with one bushel of sphagnum moss. Put half of the mixture in the hole, set the plant, and fill the hole with the remaining mixture.

The plants should not be set deeper in the soil mixture than they grew in the nursery. Do not let the roots dry out during planting. Carefully spread the roots and firm the soil or soil-peat mixture over them. Blueberry plants should be spaced 6 to 8 feet apart in rows 8 to 10 feet apart. Water thoroughly after planting. Prune one half to two thirds off the top.

Remove Flowers. Remove all flowers during the first year. Do not permit berries to develop since they will restrict shoot growth.

Fertilizers. Do not apply fertilizer until 4 weeks after planting. Then, sprinkle 1 ounce of ammonium sulfate in a circular band 12 to 18 inches from the base of each plant.

In the spring of the following year apply 2 ounces of ammonium sulfate per plant in late March or early April before the buds begin growth. Increase this amount each year by 2 ounces until a total of 8 ounces per plant is reached. Thereafter each plant will receive 8 ounces annually. A complete fertilizer, such as 10-6-4 or 10-10-10 analysis, can be used at double the above rates if growth is not vigorous. Check the soil pH every one or two years. Fertilizers prepared for acid-loving azaleas and rhododendrons also can be used at the same rates as ammonium sulfate.

Iron deficiency of blueberries can be a problem. Symptoms are yellowing and mottling of the young leaves. Iron chlorosis in blueberries is usually an indication that the soil pH is too high, thus making iron unavailable to the plant. This may be corrected by applying iron chelate to the soil or spraying it on the plant foliage in amounts recommended

by the manufacturer. However, most Illinois soils contain adequate amounts of iron.

Pruning. Pruning is generally not needed until the third year after planting if growth is normal. In early spring before growth begins, remove dead or injured branches, short and stubby branches near the ground, and old stems low in vigor. Leave vigorous branches unpruned (see Fig. 23). After the plants become 5 to 7 years old, it is important to remove some of the old branches each year. This will allow vigorous younger branches to develop.

Pruning also increases the size of the berry and promotes earlier ripening. If the plants have formed an unusually heavy load of fruit buds, the tips of the fruiting branches can be cut back to leave 4 to 6 fruit buds. Although this reduces yields slightly, the berries are appreciably larger in size. The fruit buds are easily distinguished in the spring because they are large, round, plump buds. Leaf buds are smaller, thinner, and sharply pointed.

Under good growing conditions, vigorous shoots may rapidly develop and grow several feet tall. If the tips are cut back before August 1, the canes usually develop strong lateral branches that bear fruit the following spring. Remove 3 or 4 inches when the shoot is 4 to 5 feet high.



Pruning a 4- or 5-year-old blueberry bush. Left, before pruning. Right, the same bush after removal of weak and unproductive growth. (Fig. 23)



Blueberries with bird nets.

(Fig. 24)

Birds. Birds are a serious pest in blueberry plantings. As the berries ripen, the bushes can be covered with cheesecloth or protective netting (see Fig. 24).¹ Rabbits and deer may eat twigs and branches when the ground is covered with snow. Fencing is warranted when this problem is severe.

Currants and Gooseberries

Currants and gooseberries are very hardy and easy to grow. They are discussed together since cultural practices are similar.

These two fruits are alternate hosts for blister rust, a serious disease of white pines. At present, little if any blister rust occurs in Illinois, and no state regulations exist prohibiting the growth of either fruit.

Location. Currants and gooseberries grow best in cool, moist, and partially shaded locations. The north or east side of a building, fence, or arbor may best provide these conditions.

CURRENT AND GOOSEBERRY VARIETIES FOR HOME GARDENS IN ILLINOIS

Variety	Notes
Currants	
Minnesota 71	Red currant. Vigorous, hardy, large berries.
Red Lake	Red currant. Vigorous, hardy, productive. Good quality. Large berries.
White Imperial	Pale yellow fruit. Best dessert quality. Not too productive.
Wilder	Red currant. Productive, large, bright, attractive fruit.
Gooseberries	
Pixwell	Light green fruit turns pink when ripe. Few thorns.
Poorman	Large red fruit, good quality for eating fresh.
Welcome	Dull red fruit, few and small seeds, good quality. Few thorns.

¹ Information on special protective netting for fruit plants is available from: Animal Repellents, Inc., Box 999, Griffin, Ga. 30224.

J. A. Cissel Co., Inc., Box 339, Farmingdale, N.J. 07727.

Conwed Corp., Plastics Division, 770 29th Ave. S.E., Minneapolis, Minn. 55414.

Ross Daniels, Inc., Box 430, 1720 Fuller Rd., West Des Moines, Iowa 50265.

French Textile Co., 835 Bloomfield Ave., Clifton, N.J. 07012.

Sears-Roebuck Catalog.



Gooseberries (left) and currants (right) are easily grown in Illinois. (Fig. 25)

Planting and Spacing. Plants can be set in either fall or spring but securing plants in the fall may be a problem. Spring planting is quite satisfactory but it must be done early before the buds begin growth. Vigorous, well-rooted, one-year-old plants are best. Prune off damaged roots and cut the top back to 10 inches. Set the plants with the lower branches a little below the soil level to encourage a bush form to develop. Space the plants 4 to 6 feet apart in rows 6 to 8 feet apart.

Fertilizer and Mulch. Currants and gooseberries are heavy feeders but have rather shallow root systems. An annual application of barn manure is probably the best source of fertilizer. Strawy manure may be applied each fall (November or later) and maintained 4 to 6 inches deep to provide a soil mulch. Sawdust, corncobs, straw, lawn clippings, or similar materials may also be used.

If manure is unavailable and the plants lack vigor, apply 4 ounces of 10-10-10 fertilizer per plant in early spring before growth starts. Double this amount the first year if the plants are mulched with sawdust, corncobs, or fresh straw instead of a strawy manure.

Pruning. Currants and gooseberries require annual pruning for maximum production. Red and white currants and gooseberries develop fruit from buds at the base of one-year wood and from spurs on older wood. The older wood becomes progressively less fruitful and canes older than 3 years are usually unproductive. Pruning consists mainly of selecting the proper type of fruiting wood.

Prune in early spring when the plants are dormant. After the first year, remove the weaker shoots, and leave 6 to 8 strong branches. The second year, remove all but 4 or 5 of the two-year-old branches and 4

or 5 of the one-year-old branches. On the third and subsequent years, leave 4 or 5 three-year-old branches, 4 or 5 two-year-old branches, and 4 or 5 one-year-old branches (of the previous season's growth) for a total of 12 to 15 branches per plant. When pruning, remove branches that tend to lie on the ground and remove weak branches in the center of the bush to keep the plant from becoming too dense.

Grapes

Grapes are a popular fruit for home gardens. By selecting early, mid-season, and late varieties, the home gardener can extend the harvest season from mid-August to mid-October. Grapes offer a wide range of flavors and can be used fresh or processed into wines, juice, and jelly. The trellises and arbors on which they are grown make attractive shaded areas which can be useful in landscape planning for screening off undesirable views. In recent years, French hybrid grapes have created much interest. Although most French hybrids were developed mainly for wine purposes, some are also suitable for fresh table use.



Grape clusters of Steuben.
(Fig. 26)

GRAPE VARIETIES FOR HOME GARDENS IN ILLINOIS

Season	Variety	Color ^a	Principal use ^b	Best adapted to northern (N) or southern (S) Illinois
American Varieties				
Very early	Himrod (seedless)	W	T	S
Very early	Interlaken Seedless	W	T	S
Early	Buffalo	B	T-W	N, S
Early	Ontario	W	T	N, S
Early	Portland	W	T	N, S
Early	Suffolk Red (seedless)	R	T	S
Early midseason	Fredonia	B	T-J	N, S
Midseason	Delaware	R	W	N, S
Midseason	Steuben	B	T-W	N, S
Late midseason	Golden Muscat	W	T	S
Late	Concord	B	J-W-T	N, S
Very late	Catawba	R	W-J	S
French-American Hybrids				
Very early	Aurore	W	W-T	N, S
Early	Cayuga White	W	W-T	S
Early	DeChaunac	B	W	S
Early	Marechal Foch	B	W	N, S
Early	Seyval	W	W	N, S
Early	Vignoles	W	W	S
Early midseason	Chancellor	B	W	S
Early midseason	Rosette	B	W	N, S
Midseason	Baco Noir	B	W	N, S
Midseason	Chelois	B	W	S
Midseason	Joannes Seyve 23-416	R	W	S

^a B = black or blue; W = white; R = red.^b T = table or dessert quality; W = wine; J = juice.

Planting and Spacing. Grapes should be planted in early spring, as soon as the soil can be prepared. Cut off long or broken roots so that the remaining roots can be spread evenly in the planting hole. Set the plant slightly deeper than it grew in the nursery, arranging the roots so that they are not bunched together. After planting, prune as directed on page 42. Space the plants 8 to 10 feet apart in the row and not less than 8 feet between rows.

Fertilizer. When available, manure is the best fertilizer for grapes. Apply 1 bushel of well-rotted stable manure (or 5 pounds of dry rabbit or poultry manure) around each mature vine. Spread the manure during late winter or early spring in a 4-foot circle around each plant, and not closer than 1 foot from the vine.

Commercial fertilizer may be used if manure is not available or if

the vines lack vigor. Apply 2 ounces of a 10-10-10 fertilizer (or equivalent) around each vine shortly after planting. In the early spring of the second year apply 4 ounces, the third year 8 ounces, and thereafter 1 pound per plant. Distribute the fertilizer around the plant as described above. If the soil is high in potassium and phosphorus (see your extension adviser about having the soil tested), 33-percent nitrogen fertilizer can be substituted at one-half the above rates.

Do not apply fertilizer if the vines make excessive growth. Caution and judgment must be used in fertilizing grapes to prevent rank growth which does not mature properly and which is likely to be seriously injured during the winter. Moderate growth of the canes which mature early is preferred. The addition of excessive amounts of fertilizers or other practices which encourage luxurious growth late in the season should be avoided.

Mulching. Cultivate the young grape planting for the first year. Do not cultivate deeper than 3 inches around the plants since the roots are rather shallow.

After the vines become established the grape planting can be mulched with straw, sawdust, leaves, or corncobs. Caution must be used in mulching grape vines on heavy, wet, or highly fertile soils, for they may suffer winter injury from rank growth and cane immaturity.

Supports. A trellis or arbor should be constructed before the spring following the first growing season. The grape planting is more or less permanent and the support trellis should be built to last 20 or more years. The structure must therefore be strong enough to bear the weight of mature vines and a full crop of grapes.

To build a trellis for the 4-cane Kniffin training system (described later), two wires, approximately 3 feet apart, are supported by posts which are set about 20 feet apart in the row. Galvanized wire of No. 9 or No. 10 gauge is suggested. The lower wire should be 2½ feet above the ground, and the top wire about 5½ feet above the ground. Durable wood posts (cedar, locust, white oak) should be 3 inches in diameter at the top and 8 to 8½ feet long. They should be set 2½ to 3 feet in the ground. Heavier posts should be used for the ends of the trellis. The end posts should be 5 to 6 inches or more in diameter at the top, and they should be 9 feet long so that they can be set a full 3 feet deep. The end posts should be well braced to keep the trellis wires from sagging. Metal posts may also be used for supporting trellis wires.

Grapes may also be trained satisfactorily on latticed arbors, fences, or other suitable structures. The shading provided by grape vines growing over arbors may be as important as the fruit crop.

Pruning. Grape vines produce the greatest amount of high quality fruit when they have moderate vigor. Weak vines do not have enough strength to produce normal crops. Very vigorous vines spend too much energy on growth and not enough energy on fruit production. As discussed previously, one way to control vine vigor is through adjustment of the fertilizer rate.

However, adjusting the fruit load through annual pruning is the most important step in controlling and maintaining vine vigor. Because fruit clusters only form from buds on one-year-old canes, the vines must be pruned to encourage vigorous new canes to develop, to eliminate unproductive old canes, to train fruiting canes, and to limit the number of buds on the vine. Most gardeners do not prune severely enough. Proper pruning often necessitates removal of 80 to 90 percent of the wood.

Prune after the coldest part of winter is past and before the buds begin to swell. February and early March are usually the best times in Illinois. Pruning during the summer is not recommended. The fruit does not require direct sunlight to ripen and develop full color.

Regardless of the training system used, American varieties and French hybrids should be pruned annually in one of the following ways.

American Types. The "30 + 10" rule is an excellent guide for balanced pruning of Concord and other American varieties. For each vine, 30 buds are left for the first pound of prunings removed and 10 buds left for each additional pound of prunings. For example, a one-pound vine (one pound of wood prunings removed annually) should have 30 buds left, and a three-pound vine should have 50 buds left. Varieties vary in vigor but 1- to 3-pound vines usually are the most productive.

A simpler method of pruning American varieties would be to leave 45 to 60 buds on the vigorous vines and 30 to 40 buds on the less vigorous vines.

French Hybrids. French hybrids tend to set more grapes per bud than American types; therefore, fewer buds should be left. For these hybrids, a balanced pruning system of "20 + 5" is suggested, that is, 20 buds for the first pound of prunings and 5 buds for each additional pound of prunings.

A simpler method of pruning French hybrids would be to leave 25-35 buds on vigorous vines and 20-25 buds on the less vigorous vines.

In general, short fruiting canes with 2 to 7 buds are preferred for the French hybrids. Some shoot thinning and cluster thinning also may be needed on hybrid vines with a heavy set of fruit.

Training Systems. The grape vine is quite adaptable, and the grower has a choice of several different training systems. The more

popular systems for Concord and other American varieties are the 4-cane Kniffin, the Umbrella Kniffin, and the High Cordon systems.

The 6-cane Kniffin system is preferred for most French hybrids because of the upright growth characteristics of the new shoots, but the High Cordon and the Umbrella Kniffin systems also are satisfactory.

4-Cane Kniffin. At planting time, prune the plants to a single stem with 2 buds (see Fig. 27). A shoot will grow from each of the buds left on the young plant. If the trellis is not constructed, tie the most vigorous shoot to a stake 4 to 5 feet high. At the end of the first summer the main shoot should be 3 to 4 or more feet high, and may be long enough to reach the top wire of the trellis.

Second Year. In early spring, while the vine is dormant, prune off all but the strongest cane. Tie the cane tautly to the top wire of the trellis or to the lower wire if it is not long enough to reach the top wire. This cane will form the permanent trunk.

During the second growing season, remove shoots that develop below the lower wire, remove flower clusters, allow the main trunk to reach the top trellis wire, and allow some short lateral canes to develop along each wire.

Third Year. If 1 to 4 strong lateral canes developed during the sec-



A newly planted grapevine before (left) and after (right) pruning. (Fig. 27)

ond year, they may be trained to trellis wires. Otherwise, cut the vine back to a single vertical trunk. In either case leave two buds (renewal spurs) on each of two shoots near the lower and upper trellis wires. Fruiting canes for next season grow from these buds.

During the third summer, numerous lateral canes will develop which should bear a good crop during the fourth year (Fig. 28). A few grapes may be produced during the third year from the laterals (if any developed during the second year), or from buds on the upper part of the main trunk.

Mature Vines. After the third year, the vines can be treated as mature vines (Fig. 29). In early spring, prune the vine to 4 lateral canes, each with 6 to 12 buds, arising from the main trunk. Each of these buds is capable of producing 2 or 3 clusters of grapes. Leave 2 renewal spurs near the main trunk for future fruiting canes at each trellis wire. Remove all other growth.

Select canes of moderate vigor for the lateral fruiting canes. They should be $\frac{1}{4}$ to $\frac{1}{3}$ of an inch in diameter, straight, and preferably unbranched. Do not select canes less than $\frac{1}{4}$ of an inch in diameter, or canes that are long, heavy, vigorous "bull canes." Train one cane each way on the trellis wires. These lateral canes should originate from the main trunk or as near to it as possible on the arms.

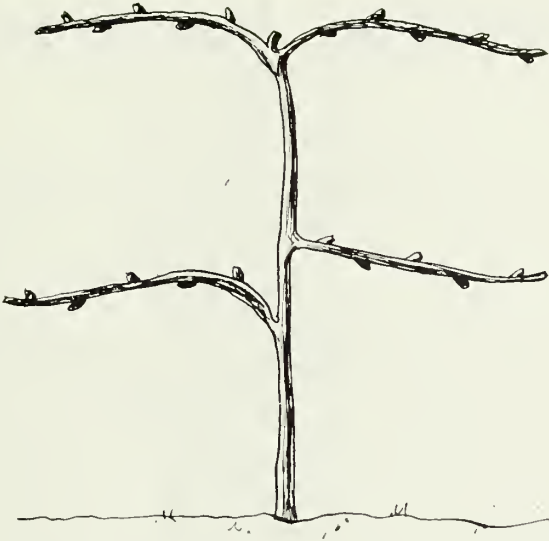
After pruning, loop or spiral the canes over the support wires and tie with binder twine or other durable material (see Fig. 29).

6-Cane Kniffin. This system, recommended for French hybrids, is similar to the 4-cane Kniffin system except that a 3-wire trellis is used instead of a 2-wire trellis, and 6 fruiting canes are selected instead of 4 (Fig. 30). Two trunks are suggested, but one may be used.

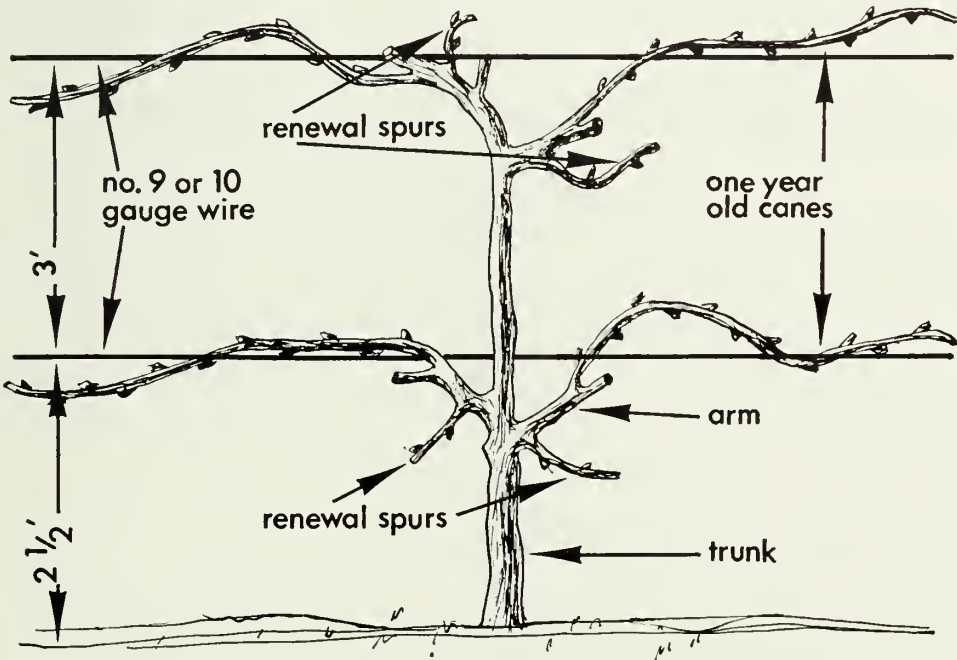
Umbrella Kniffin. This system is a modification of the 4-cane and the 6-cane Kniffin systems and can be used on 2-wire or 3-wire trellises. The trunk or trunks are terminated 6 to 12 inches below the top wire. Three to six canes are shortened to 6 to 10 buds each, are bent over the top wire, and are tied to a lower wire. Two or three other canes are shortened to 2 buds to serve as renewal spurs and to provide the fruiting canes for the following year's crop. All other canes are removed. (See Fig. 31.)

The Umbrella Kniffin system can be used for both American and French hybrid varieties.

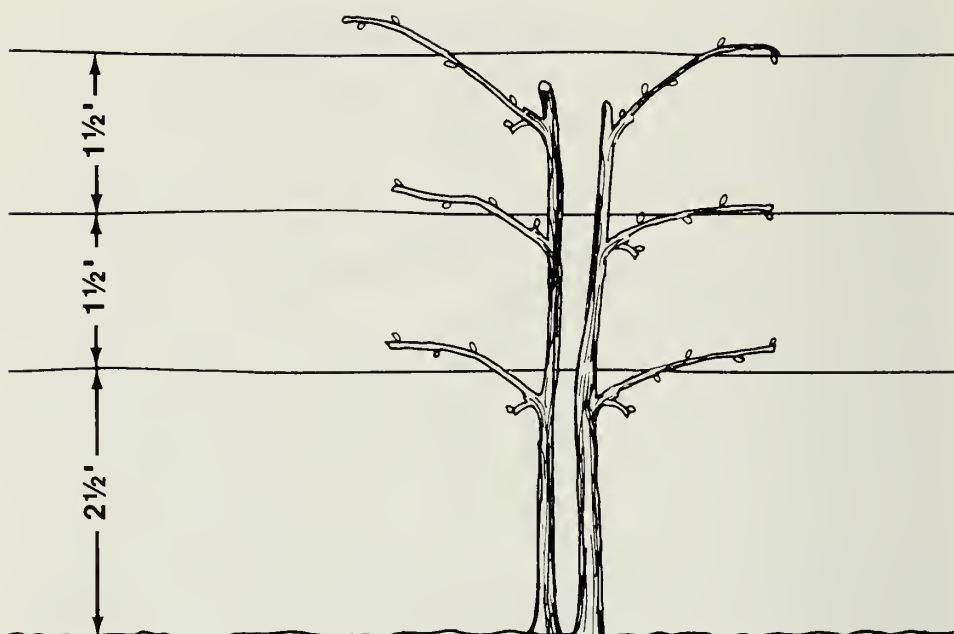
High Cordon. In this system the trunk or trunks are trained along a wire 5 to 6 feet from the ground to form cordons (Fig. 32). Canes growing from the lower side of the cordons are selected and are



After two growing seasons, 4 lateral canes may develop on vigorous plants, and 4 to 6 buds may be left on each lateral cane. (Fig. 28)

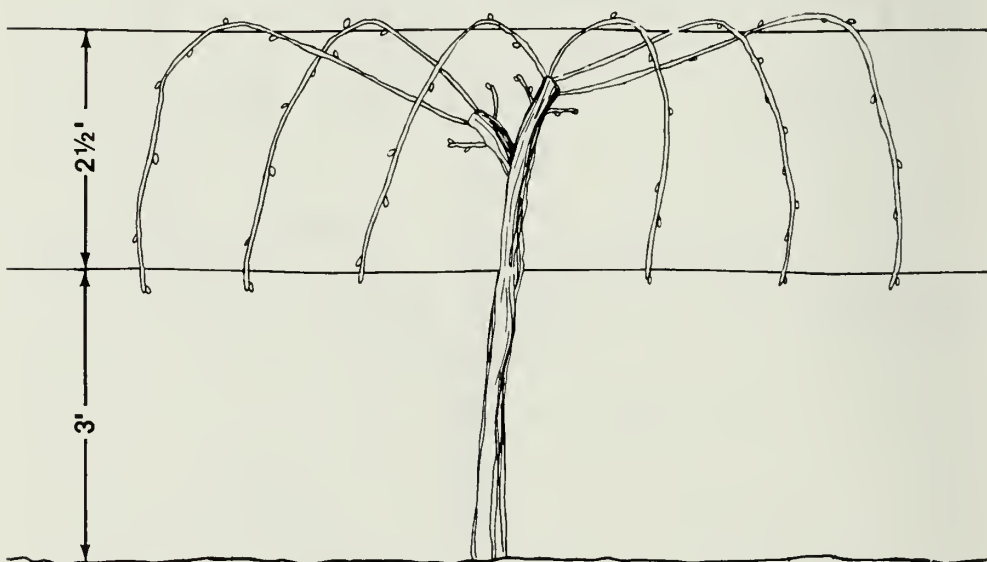


A grapevine after three growing seasons. A maximum of 12 to 15 buds may be left on each lateral cane. (Fig. 29)



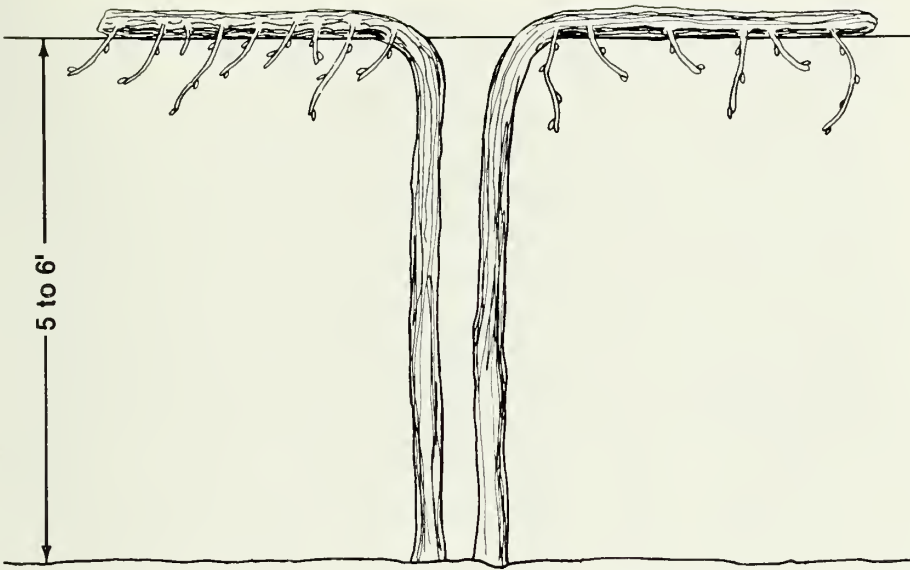
Six-cane Kniffin training system using two trunks.

(Fig. 30)



Umbrella Kniffin training system. Long prune to 6 to 10 buds on each cane.

(Fig. 31)



High Cordon training system. Short prune to 2 to 4 buds on each cane.

(Fig. 32)

“short pruned” to 3 to 4 buds each. Canes arising from the upper part of the cordons are removed. During the early part of each growing season, new shoots arising from the upper part of the cordons are removed. Shoots arising from the fruiting canes are “combed” or positioned to grow downward to form a curtain.

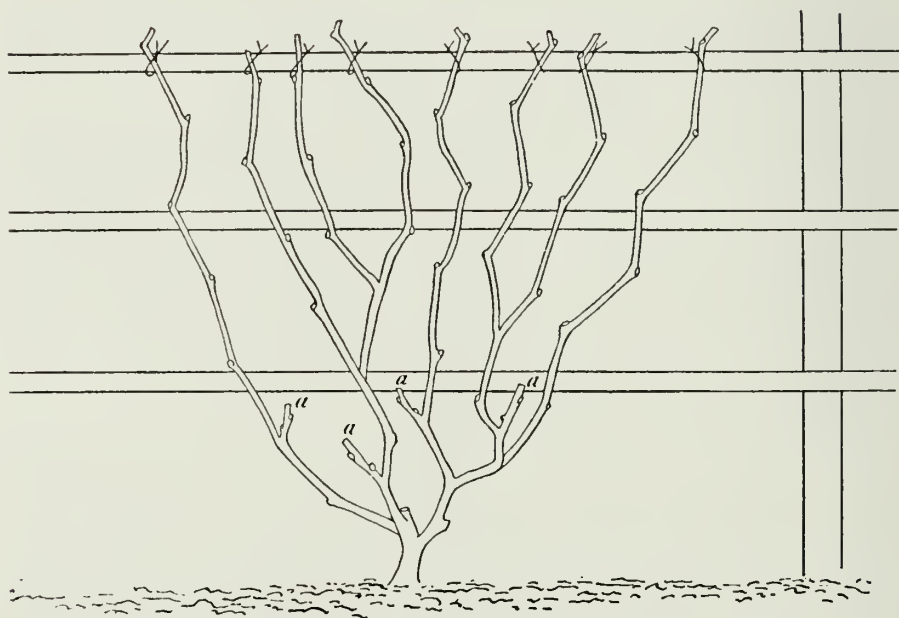
American types with droopy growth habits are well adapted to the High Cordon system. Ease of pruning is the outstanding characteristic. French hybrids also can be grown under this system but are less likely to form a curtain because of their upright growth characteristics.

Training and Pruning on Arbors. American grapes make excellent dual-purpose vines when trained on arbors, on a pergola for a summer roof, on a fence or wall — almost anything will work. Good varieties, properly cared for, will produce good-quality fruit as well as shade or screen for the home landscape.

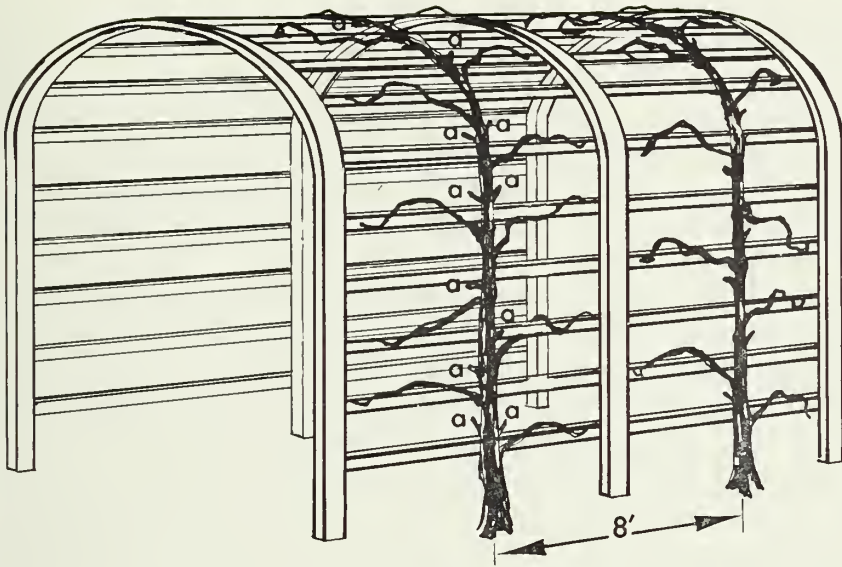
An endless variety of sizes and designs are used as supports for grapes. Whatever the design, use materials that permit long-time use with a minimum of repair. Wood, metal, masonry, or a combination of these is appropriate. Wire mesh is not recommended: It makes a fine support for the vines, but training and pruning operations are extremely difficult. Allow at least 8 feet between vines. Spacing too close results in a jungle-like growth which favors the development of diseases,

interferes with satisfactory fruiting, and makes pruning difficult. When designing the structure and when subsequently training and pruning, keep in mind that the reason for growing grapes this way is to combine fruit production with shade or screen.

For training grape vines on fences or walls, the 4-cane Kniffin system described on pages 43 and 44 and the 6-cane Kniffin system described on page 44 are perhaps the easiest to establish and maintain. Another system, the fan system (Fig. 33), is one of the best on fences and walls. Instead of being trained to a single trunk, the vine is allowed to branch a short distance above the ground, and the branches are trained into a fan-shaped arrangement. The branching is induced by pinching off the tip of the young vine during the growing season at the point where branching is desired. The side branches that develop may also be pinched to obtain more stems and positions. Since several stems are needed, don't expect to develop the entire skeleton the first season of training. Once the final form of the fan system is obtained, it is maintained by annually selecting the desired one-year-old canes and leaving renewal spurs at the base of each branch to produce fruiting canes for the following year as with other systems. The number of fruiting canes and the number of buds on each are determined by the vigor of the individual vine. If cane growth is rank and the fruit poor,



A mature grapevine trained and pruned to the fan system. Note renewal spurs (a). (Fig. 33)



Mature grapevines trained and pruned on an arbor. Note renewal spurs (a).
(Fig. 34)

leave more buds. If cane growth is sparse and bunches of grapes are numerous and ripen unevenly, cut back more severely.

When overhead cover is desired on arbors or pergolas, the permanent single trunk is carried up along the top of the structure (Fig. 34). Each year, one-year-old canes 3 or 4 feet long are distributed at intervals of 2 or 3 feet along this permanent trunk. Renewal spurs of 2 or 3 buds are distributed along the trunk in the same manner to produce new fruiting wood from which to select the one-year-old canes for the following year. This type of pruning is not severe enough for best fruit production, but it results in the desired shade. As with other systems, the amount of bearing wood needs to be adjusted for the vigor of the vine, but remember that most home arbors soon become a tangled mass of vines because of failure to prune heavily enough.

Pruning Neglected Vines. Old vines which have not been pruned for one or more years will be dense and may have several stems or trunks arising from the roots. Basically the job is to select a frame (main trunk, fruiting arms, and renewal spurs). Desirable fruiting wood may be far from the main trunk, and if very severe cutting is necessary it is best to renew the vine gradually (prune half the first year and half the next). If neglected vines have several trunks, remove 2 or 3 each year until 1 to 3 remain. Select young canes for the future trunks if the older trunks are malformed. Prune the older portion of the plant out

gradually while maintaining moderate fruit production until the new trunks are ready to take over.

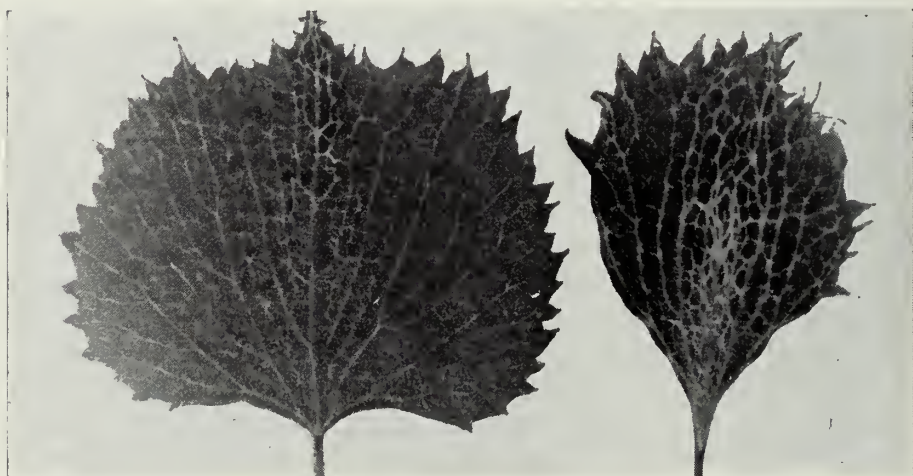
Multiple Trunks. Winter cold may damage the trunk as well as the canes and fruit buds. Multiple trunks and trunk renewal can help to minimize cold damage to the trunks. When cold damage can be a problem, the ideal situation is to have 2 to 4 trunks of different ages for each vine. Usually the older trunks are more susceptible to winter damage than the younger trunks.

Every 2 or 3 years a sucker arising from the base of the plant (either from the root or lower trunk of the rooted vines or from the trunk above the graft union for grafted vines) is kept and trained to form a straight trunk. If the sucker grows properly, the old trunk is removed the following spring and replaced by the new trunk.

Chemical Injury. Grapes are one of the most sensitive plants to many chemicals, particularly herbicides containing 2,4-D. *Do not apply* fertilizer that contains 2,4-D to the lawn area near grapes. Avoid using any 2,4-D or sprayers that have contained 2,4-D in the vicinity of grapes. Enough 2,4-D can drift $\frac{1}{2}$ to 1 mile by air to ruin your grape crop. Injury may be indicated by misshapen leaves, tendrils, and young shoots. The leaves may have sawtooth edges and may be narrow and fanshaped. The grapes may ripen unevenly or not at all. The symptoms appear 1 to 3 weeks after exposure to the fumes (Fig. 35).

Pest Control

To have a successful fruit garden, one must be aware of many diseases and insect pests and be prepared to control them. Home fruit



2,4-D injury on grape leaves.

(Fig. 35)

growing is usually an avocation rather than a vocation, and a person often has neither the time nor the inclination to spend a great deal of time spraying. Thus, most pest control programs for the home fruit garden are quite limited, although they can also be extremely successful.

Pest control begins with the selection of a suitable planting site and consideration of previous cropping history, followed by selection of disease-resistant varieties, use of healthy disease-free planting stock, and, finally, the use of good cultural and sanitation practices. These factors are discussed on the following pages as they apply to each small fruit. The use of chemicals to control certain insects and diseases is often necessary because sanitation practices are not always adequate in themselves. A well-timed chemical application may mean the difference between a good crop and no crop at all. See Circular 1145, "Home Fruit Pest Control" (listed on page 54) for spray recommendations.

Strawberries

Strawberries can be extremely successful when a small number of precautions are taken against pests. The most damaging insects are the strawberry weevil, which is called "clipper" because it cuts off the buds and fruit, leaving them hanging as though they had been partly broken off; the "cat-facing" insects (many different sucking insects) which produce a deformed, low-quality berry; the crown borer, a white, thick-bodied grub, $\frac{1}{5}$ inch long, which feeds inside the plant at the soil level so that it dies or is weakened; and white grubs, large grubs, up to 1 inch long, which kill the plant by feeding on the roots. The important diseases are gray mold which kills the blossoms and rots the fruit, and red stele and Verticillium wilt, both caused by soil-borne fungi that infect the roots and kill the plant. Leaf spots and blights are symptoms of some diseases. The recommended chemicals and spray schedules are given in Circular 1145 "Home Fruit Pest Control" (see page 54).

Sanitation. Use of cultural and sanitary practices is of utmost importance in controlling various diseases and insects of the strawberry. The following practices are recommended:

1. Plant strawberries on land that has been under cultivation for one or two years, if possible (see page 4).
2. To control crown borer, locate new beds more than 300 feet from old beds, and plow up the infested patch immediately after harvest.
3. When possible, choose varieties that are resistant to diseases (see pages 18 and 19).
4. Renovate beds immediately after each harvest (see page 14).

5. Obtain virus-free plants for new plantings. Reliable nurseries have virus-free plants readily available to everyone.

6. Since *Verticillium* wilt is a soil-borne disease which enters through the roots, avoid planting strawberries after other crops that are susceptible to this disease—such as tomatoes, potatoes, eggplant, melons, beets, peas, brambles, and roses.

Brambles

Sanitation. Certain diseases of brambles cannot be controlled by chemicals. These are: crown and cane gall, bacterial diseases that produce large tumor-like growths on the roots and canes; orange rust (primarily on blackberries), a destructive systemic fungus disease that appears each spring as masses of bright orange spores on the lower surface of leaves; and three viral diseases which are characterized by their names, mosaic, leaf curl, and streak (dark blue or violet blue markings which appear longitudinally on the canes from the ground up).

The following sanitary procedures should be observed:

1. Wait at least 3 years to replant a site where crown and cane gall or *Verticillium* wilt-infected plants have grown.

2. Select resistant varieties when available.

3. Order plants from a reliable nursery.

4. Plant red raspberry varieties 600 feet (or as far as practical) from other brambles, cultivated or wild, to protect against spread of mosaic viruses. Or purchase virus-free stock.

5. At planting time, cut off old stubs of 2-year-old nursery stock and “handles” of young purple and black raspberries. These are left on the plant by the nursery to facilitate handling. The old stubs may be infected with anthracnose, a serious fungal disease of many brambles.

6. As soon as plants with a disease that cannot be controlled by chemicals are detected, dig them up with as many of their roots as possible, and burn them at once or place them in the trash can.

7. Prune out canes that do not leaf-out normally in the spring.

8. Immediately after the summer harvest remove and burn all canes that have just fruited. Also cut out surplus or weak canes and those showing injuries. Canes of everbearing red varieties being grown under the two crop system are not removed after the fall harvest.

9. Remove nearby wild brambles and neglected plantings since they are a source of disease and insect pests.

10. To protect against *Verticillium* wilt (caused by a soil-borne fungus that infects the roots), do not plant brambles where tomatoes,

potatoes, eggplant, melons, beets, peas, roses, or strawberries have grown within the past 3 years.

11. Keep plantings as free of weeds as possible to reduce losses from insect pests and diseases.

Spray Schedule. Use the spray schedule for brambles (raspberries and blackberries) outlined in Circular 1145.

Blueberries

Because blueberries are a relatively new crop in Illinois, the pests affecting them have not assumed major importance. If pest control is needed, follow the spray schedule for blueberries in Circular 1145.

Currants and Gooseberries

These fruits require a very minimal spray program. The important insects, for both fruits, are the currant aphid which causes bright red, cupped, distorted, or wrinkled areas on the leaves; the imported currant worm, about 1 inch long and greenish with black spots, which feeds on the edges of the leaves; the cane borer, a worm $\frac{1}{2}$ inch long which burrows the entire length of the cane and dwarfs the plant; and scale insects whose very small, grayish, nipple-shaped bodies can be seen on the bark. The important diseases are anthracnose and leaf spot, which cause a spotting of the leaves and a yellowing which is most pronounced on the gooseberry; cane blight, which may suddenly wilt and kill scattered canes or bushes; and powdery mildew, particularly on gooseberry, which forms white patches on the surface of leaves, shoots, and berries, eventually distorting them. For these and other insect and disease problems the spray schedule outlined in Circular 1145 is effective.

When pruning currants and gooseberries during the dormant season, watch for signs of cane borers (hollow canes with black centers). Cut such canes out entirely and burn all prunings immediately. Keep the plants from becoming too dense (see pages 38 to 39 for pruning instructions). This can reduce damage from diseases by allowing good air circulation and quick drying of the foliage.

Currant canes may suddenly wilt and die during the growing season from cane blight. Cut out such canes and burn them immediately or place them in the trash can.

Grapes

Spraying grapes usually gives excellent control of troublesome pests that occur in most seasons. The grape berry moth which causes wormy

fruits, and leafhoppers which are small brightly colored insects that feed on the leaves and produce tiny whitish spots and sickly appearing plants, are the most troublesome insects. The important fungal diseases are black rot, which causes brownish circular leaf spots and black, wrinkled, dried-up fruit; and downy mildew, which results primarily in a scorched appearance of the leaves. For spray schedules, see Circular 1145.

References

The following references are listed for gardeners seeking more detailed information on varieties, culture, propagation, and disease and insect control of the small fruits.

Books

- Blueberry Culture*, Paul Eck and N.F. Childers, Rutgers University Press, New Brunswick, N.J. 08900, 1966.
Handbook on Fruits in the Home Garden, Brooklyn Botanic Garden, Brooklyn, N.Y. 11200.
Modern Fruit Science; Orchard and Small Fruit Culture, N.F. Childers, Horticultural Publications, Rutgers University, New Brunswick, N.J. 08900.
The Pruning Manual, E.P. Christopher, Macmillan Co., New York, N.Y. 10000, 1960.
Small Fruits for Your Home Garden, J.H. Clarke, Doubleday and Co., Garden City, N.Y. 11530, 1958.
The Strawberry, George M. Darrow; Holt, Rinehart and Winston; New York, N.Y. 10000, 1966.

Circulars and Pamphlets

The circulars listed below may be obtained from the Office of Publications, 123 Mumford Hall, University of Illinois at Urbana-Champaign, 1301 W. Gregory Drive, Urbana 61801.

(Single copies free unless indicated.)

- C 1056 Tips on picking and using Illinois strawberries. 16 pp.
 C 1138 Pesticides and honey bees. 6 pp.
 C 1144 Controlling weeds in home fruit plantings. 11 pp.
 C 1145 Home fruit pest control. 8 pp.
 SP 56 Illinois fruit and vegetable garden schedule. 40 pp. \$1.50.

The following bulletins may be obtained from the Office of Information, U.S. Department of Agriculture, Washington, D.C. 20025.

- AB 408 Growing fruits and nuts.
 F 1028 Strawberry culture: eastern United States.
 F 2123 Growing American bunch grapes.
 F 2140 Strawberry diseases.
 G 207 Thornless blackberries for the home garden.

The publications listed below may be obtained from the Department of Horticulture, 124 Mumford Hall, University of Illinois at Urbana-Champaign, 1301 W. Gregory Drive, Urbana 61801.

- FR-1-79 Propagating grapes from cuttings.
 FR-2-80 Sources of small fruit plants.
 FR-3-80 Distinguishing thornless blackberry cultivars.

The publications listed below may be obtained from the Department of Plant Pathology, N-533 Turner Hall, University of Illinois at Urbana-Champaign, 1102 S. Goodwin Avenue, Urbana 61801.

(Single copies 10 cents.)

- FL 1 Strawberry spray schedule.
- PD 700 Raspberry anthracnose.
- PD 701 Strawberry red stele root rot.
- PD 702 Strawberry leaf diseases.
- PD 703 Black rot of grape.
- PD 704 Gray mold of strawberries.
- PD 705 Downy mildew of grape.
- PD 706 Leaf variegation in strawberries.
- PD 707 Verticillium wilt of strawberry.
- PD 708 Orange rust of brambles.
- PD 709 Spur blight and cane blight of raspberries.
- PD 710 Virus diseases of brambles.
- PD 711 Failure of fruit set in blackberries.

Notes and Records

For future reference, you should record information about your small fruit plantings, such as the source of your plants, the varieties used, the dates of plantings, and so on.



FOR YOUR PROTECTION

Always handle pesticides with respect. After all, the people most likely to suffer ill effects from pesticides are the applicator and his family. Accidents and careless, needless overexposure can be avoided. From 1960 through 1968 there were 24 deaths in Illinois due to accidental ingestion of pesticides — 15 from insecticides, 5 from rodenticides, and 4 due to a herbicide.

Each year more than 750 Illinois children under 12 years of age are rushed to a doctor because of suspected pesticide ingestion or excessive exposure. A study of such cases showed that 50 percent of the children obtained the pesticide while it was in use and 13 percent obtained it from storage. Fifty-three percent of the cases involved pesticides used as baits. These accidents could have been prevented. The following suggestions for safe use of pesticides are designed to prevent such unfortunate careless accidents.

1. Store pesticides out of reach of children, irresponsible persons, or animals; preferably store in a locked cabinet away from food or feed.
2. Put pesticide containers back in the storage area before applying pesticide. Children have found open bottles by the water tap.
3. Avoid breathing pesticide sprays and dusts over an extended period. This is particularly true in enclosed areas such as crawl spaces, closets, basements, and attics.
4. Wash with soap and water exposed parts of the body and clothes contaminated with pesticide.
5. Wear rubber gloves when handling pesticide concentrates.
6. Do not smoke, eat, or drink while handling or using pesticides.
7. Do not blow out clogged nozzles with your mouth.
8. Leave unused pesticides in their original containers with the labels on them and in locked cabinets.
9. Wash out empty pesticide containers and then bury them, burn them, or haul them to the garbage dump.
10. Do not leave puddles of spray on impervious surfaces.
11. Do not apply pesticides to fish ponds, bird baths, or pet dishes.
12. Do not apply pesticides to dug wells or cisterns.
13. Observe all precautions listed on the label. Use pesticides only on the *crops* specified, in *amounts* specified, and at *times* specified.

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